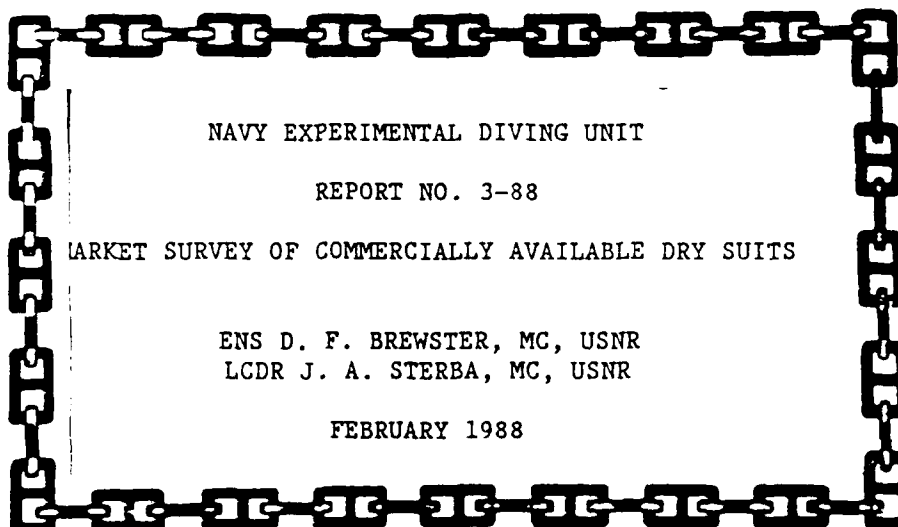


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NAVY EXPERIMENTAL DIVING UNIT

REPORT NO. 3-88

MARKET SURVEY OF COMMERCIALY AVAILABLE DRY SUITS

ENS D. F. BREWSTER, MC, USNR  
LCDR J. A. STERBA, MC, USNR

FEBRUARY 1988

NAVY EXPERIMENTAL DIVING UNIT



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DEPARTMENT OF THE NAVY  
NAVY EXPERIMENTAL DIVING UNIT  
PANAMA CITY, FLORIDA 32407-5001

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zipper configuration, valve placement, wrist seal and glove connection, hood and boot configuration, manufacturing lead time, cost and additional information to the consumer. Due to a paucity of valid scientific evaluations of dry suits, comparisons between dry suits could not be made. It has been strongly recommended by dry suit diving authorities that a diver must first have a minimum of 10 supervised dry suit orientation dives before becoming competent in dry suit diving. Thereafter, divers can reliably evaluate dry suits during demonstration dives. Until U.S. Navy instructions change, the selection of a dry suit, like a wet suit, is by diver preference (NAVSEAINST 10560.2). Further diving research is needed to help direct the diver to select the appropriate PTS based not only upon water temperature, but dive duration and other mission specific requirements.

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### ABSTRACT

The combination of a dry suit worn over an insulating undergarment is called the Passive Thermal System (PTS), formerly called the Passive Diving Thermal Protection System (PDTPS). In support of NAVSEA Task #88-18 to test and evaluate various PTS, a market survey of currently available dry suits was conducted. This report is based upon information gathered at the 1988 Divers Equipment Manufacturing Association (DEMA) Conference in New Orleans and by four weeks of telephone calls and written correspondence with dry suit company engineers and sales representatives. Due to upcoming changes in dry suit design, it is anticipated that this report will soon need to be updated. This report describes the following information from the ten dry suit companies: company address and telephone number, company information, users of the dry suit, dry suit material used, sizes, nonmagnetic capability, zipper configuration, valve placement, wrist seal and glove connection, hood and boot configuration, manufacturing lead time, cost, and additional information to the consumer. Due to a paucity of valid scientific evaluations of dry suits, comparisons between dry suits could not be made. }

It has been strongly recommended by dry suit diving authorities that a diver must first have a minimum of 10 supervised dry suit orientation dives before becoming competent in dry suit diving. Thereafter, divers can reliably evaluate dry suits during demonstration dives. Under current U.S. Navy instructions (NAVSEAINST 10560.2), the selection of a dry suit, like a wet suit, is by diver preference. Further diving research is needed to help direct the diver to select the appropriate PTS based not only upon water temperature, but dive duration and other mission specific requirements.

## I. INTRODUCTION.

There is a need for comfortable, functional dry suits which allow a diver to perform useful work in extremely cold water without developing hypothermia. The Passive Thermal System (PTS) originally called the Passive Diver Thermal Protection System (PDTPS), is a combination of a dry suit and an insulating undergarment. In order to develop the PTS to meet mission specific guidelines (e.g., water temperature, dive duration, swimming vs. rest, hand dexterity requirements), a market survey of commercially available, heavy-duty dry suits was done.

According to NAVSEAINST 10560.2, the U.S. Navy SCUBA divers choice of a variable volume dry suit is by "diver preference." With the dry suit market greatly expanding over the past few years, the U.S. Navy diver must evaluate much information of questionable reliability before reaching a purchasing decision. There is presently no comprehensive guide which accurately describes the currently available dry suits. Therefore, the purpose of this report is to provide accurate information about dry suits to both the U.S. Navy diver and those conducting PTS diving research.

## II. METHODS.

Technical and marketing information for this report was obtained from dry suit company engineers and sales representatives by telephone conversation, correspondence, and brochures over a period of four weeks. In addition, information was obtained from the 1988 Diving Equipment Manufacturers Association (DEMA) Conference in New Orleans.

A recent NEDU Technical Memorandum No. 86-03 attempted to summarize the few studies done in evaluating and comparing dry suits. It was concluded, however, that the proper use of dry suits, and also human performance while wearing dry suits were not objectively assessed, nor were comparisons between suits valid.

In this report, no subjective or objective data will be presented to compare dry suits with one another. This report describes the technical characteristics of each dry suit by using the headings described below:

### Company Information:

This will include addresses and phone numbers of each company whose dry suit is described. Any additional company information which may be of some value to the consumer will also be noted.

### Users:

The user of a particular dry suit may be the best source of information for dry suit performance, quality, and versatility.

### Material:

There are several material types used in dry suits. Natural rubber suits are more flexible, more resistant to abrasions, but have poor insulating properties. Neoprene offers more thermal insulation due to trapped gas within the material. Compression of a neoprene suit with depth will decrease the thermal insulation. Neoprene also restricts mobility. It has been postulated that repeated compression and decompression of neoprene may weaken neoprene to reduce the thickness and therefore thermal insulation.

### Sizes:

For most people a standard size, "off-the rack," dry suit is adequate. There are those divers, however, who are especially tall or obese who may require a custom fit suit for both dexterity underwater and proper use of the suit. Whether or not a custom dry suit requires a smaller suit inflation cylinder or is easier to swim in due to decreasing drag, has yet to be determined. The undergarment used will also affect the comfort and flexibility of the diver.

### Nonmagnetic:

Certain U.S. Navy operational diving groups, e.g., explosive ordnance divers (EOD), require nonmagnetic dry suits. If a suit does not have documented magnetic testing, it should not be considered nonmagnetic simply because it has no metallic features. Brushing a dry suit with a wire brush greatly enhances the magnetic signature of a dry suit. Magnetic signature is usually determined by the user of the dry suit.

### Zipper:

The placement of the zipper in a dry suit is a good indication of the ease of donning and doffing the suit. Zippers may be across the chest, abdomen, upper back or around the shoulders. There are conflicting reports as to which zipper configuration is easiest to use. Dry suit divers should assess this according to preference. The covering system for the zipper is also important to insure a non-leaking or protected closure system, especially if the diver must crawl through sandy areas.

### Valves:

There are two valves on every dry suit: an inflation valve and an exhaust valve referred to as I and E valves, respectively. Some suits have valves already placed in standard positions. Other companies allow valves to be positioned by request to avoid interfering with certain harness configurations.

### Wrist:

Latex wrist seals are the standard in dry suit design. Some companies have developed special attachment systems for gloves and these will be detailed. A reliable dry glove connection has yet to be developed.



#### Hoods:

Hoods come either attached, as an integral part of the dry suit or as a separate unit. Some companies do not make hoods. The type of face seal built into the hood will determine diver comfort and the mask sealing capability.

#### Boots:

Vulcanized rubber work boots gives the most protection but may not be available on all suits. Variations in the boots will be noted. In most suits the boots are an integral part of the suit; few suits come without boots. A large boot gives more room for undergarment insulation. Large boots also require large foot-pocket fins.

#### Lead Time:

This is an estimation of the time it would take to receive a standard dry suit once it is ordered.

#### Cost:

This will be a 1988 estimate for a standard, stocked dry suit. Dry suits ordered with extra equipment (i.e., custom fitting, special valve placement, special wrist attachments) will be more expensive.

#### Additional Information:

This section will detail any special features of the particular dry suit being reviewed.

Many of the manufacturers do not make dry gloves. No company manufactured gloves integral with the dry suit, therefore, information on gloves was very limited, and omitted.

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AMERICAN DIVING CORPORATION (ADC) "DRI FLEX DRY SUITS"

Suit Manufacturer: American Diving Corporation  
34202 Johnsons Landing Road  
Scappoose, Oregon 97056  
Telephone: (503) 543-5151

Company Information: As of this report, ADC has been in operation for 3 years.

Users: Search and Rescue groups in the Northwest United States.

Suits: Flex 2000 Black-lite series.

Material: Polyprene with polyurethane nylon outershell.

Sizes: Standard sizes and custom fitting available.

Nonmagnetic: No formal testing done.

Zipper: Zipper is waterproof and runs across the back from shoulder to shoulder. There is no special covering system for the zipper.

Valves: Valves will be placed at the diver's discretion.

Wrists: Latex seals; no glove attachment system is available.

Hood: Hoods are made of neoprene and not attached. They have a zipper in the back and an 1/8-inch neoprene face seal.

Boots: Boots are hard-soled and attached.

Lead Time: Two weeks on stock sizes; 4-6 weeks on custom fit suits.

Cost: Standard size system \$569  
Custom fit system \$690  
(System includes: Dry suit, undergarment, bag, without hood.)

Additional Information: Suits available in many colors, including black. Seams are "mauser" interlocking stitched, and then vulcanized into one piece. There are no "glued" seams.

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BELL AVON: AVON DRY SUITS

Suit Manufacturer: Bell Avon  
1200 Martin Luther King, Jr. Blvd.  
Picayune, MS 39466  
Telephone: (601) 799-1217

Company Information: Bell Avon distributes Avon dry suits in the U.S. Avon is a British company which has been manufacturing commercial and military dry suits for more than 20 years.

Users: Avon supplies 3,000 suits per year to the British Royal Navy. They are also used by NATO and other Navies.

Suit: Commercial back zipper entry suit.

Material: Natural rubber lined with a two-way stretch nylon fabric.

Sizes: No custom fitting available; standard sizes are in European sizes (2-6).

Nonmagnetic: The suits made for the Royal Navy are tested by Code of Practice MYU 3D/145 with maximum magnetic permeability after manufacture not to exceed 1.005.

Zipper: A zipper is placed across the back from shoulder to shoulder. There is no covering system over the zipper. There is also a neck entry suit available with a neck ring and seal system.

Valves: Apex valves are sold separately, Bell Avon will install them in specified locations.

Wrists: Wrists have latex cuffs as a standard part of the suit, although cuff rings, or heavy duty neoprene cuffs are available.

Hood: Hoods may be separate or integral and are available in both latex and coated fabrics.

Boots: Hard sole boots are integral to the suit.

Lead Time: One to two weeks.

<u>Cost:</u> Neck Entry Black	\$ 729
Neck Entry Red	\$ 814
Zipper Entry Black	\$ 922
Zipper Entry Red	\$1013

DIVING UNLIMITED INTERNATIONAL (DUI)

Suit Manufacturer: DUI  
1148 Delevan Dr.  
San Diego, CA 92102  
Telephone: (619) 236-1203

Company Information: DUI has long been a leader in dry suit manufacturing. Studies have been done on the thermal performance of their suits and is published in their Thermal Insulation Guide. They are also involved in the manufacturing and sales of Thinsulate undergarments. DUI has also developed a video tape on dry suit diving, entitled: Diving Dry, which is both instructive and informative.

Users: DUI dry suits are used by many military operational groups and is the preferred dry suit of many U.S. Navy divers, including SEAL teams and Air Amphibious Operations groups.

Suits: They manufacture several styles.

Material: 1) CF200 is a high density neoprene with heavy duty outer lining and a standard weight nylon inner lining.

2) Tri-laminate system (TLS): Butyl rubber sandwiched between two layers of nylon.

Sizes: DUI suits (all types) come in standard sizes only CS, M, L, XL.

Nonmagnetic: All military dry suits are nonmagnetic

Zipper: DUI suits have waterproof zippers placed diagonally across the front torso from the left shoulder to the right hip. The zipper is covered by a second Delran zipper and flap for extra protection.

Valves: E: left upper arm; I: right hip.

Wrists: Both latex and neoprene wrist seals are available. They have also developed hard wrist rings to create a sealing surface for a glove or mitt which is then secured by an outer ring.

Hood: All DUI hoods are neoprene with glued and sewn seam construction. A self-venting center comb allows air to vent out, but prevents water from entering in. The thickness of the hoods varies from 1/8 to 1/4 inch to maximize warmth and comfort. Hoods can be attached or separate (mates to warm-neck collar) and have neoprene face seals.

Boots: CF 200 molded sole boots, with optional latex socks on all suits. All boots are attached and fin-keeper straps are available.

Lead Time: Approximately 2 weeks.

Cost: Standard CF 200 dry suit: \$1,549  
Standard TLS fabric dry suit: \$1,129

Additional Information: The CF 200 suit has butt-glued seams on the outside with 1/2-inch elastic sealing surface area inside. The TLS suit has fold-over seams and is double stitched and then coated with Elastoseal <sup>™</sup>.

DUI also manufactures dry gloves and other dry suit accessories such as a urinary overboard dump system (UODS) and pony bottles with pouches.

DUI suits are well covered by a one-year warranty for most problems and a four-year delamination warranty.

Several colors are available, including black.

Suits are equipped with suspenders, adjustable crotch strap, and a telescoping torso to allow fitting of all body lengths.

### NOKIA DRY SUITS

Suit Manufacturer: AMRON International Diving Supply  
759-T West Fourth Ave  
Escondido, CA 92025  
Telephone: (619) 746-3834

Company Information: AMRON is the sole U.S. distributor of the Nokia dry suit which is manufactured in Norway by Nokia Theirsuit. This suit was designed for Icelandic divers, and is the competitor suit to Poseiden suits in Scandinavia. The suit arrives at AMRON unfinished where they place the valves and make modifications.

Users: Commercial Icelandic divers.

Suit: Nokia dry suit (one type only) called the "Boss"

Material: Rubber on tricot (polyester) similar to the Viking dry suit material.

Sizes: Standard sizes only; no custom fitting, but AMRON will modify them at request. (Sizes are in European sizes.)

Nonmagnetic: No formal testing has been done.

Zipper: Zipper is waterproof and across the back from shoulder to shoulder. There is no special covering system.

Valves: AMRON will place Apex valves at buyers' preferred location.

Wrists: Latex wrist seals, an interlocking ring system is available for glove attachment.

Hood: Made of crushed neoprene with latex neck and face seals. Head is not integrated to the suit but can be attached through an interlocking ring system.

Boots: Heavy rubber work boots are attached to the dry suit and have a built-in fin holder on the heels.

Lead Time: Two to three weeks.

Cost: \$1,300 (complete suit with neck seals).

O.S. SYSTEMS

Suit Manufacturer: O.S. SYSTEMS  
P.O. Box 864  
33550 S. E. Santosh  
Scappoose, Oregon 97056  
Telephone: (503) 543-3126

Company Information: Formerly Offshore Diving Equipment, O.S. Systems continues to redesign and develop offshore sport and commercial dry suits.

Users: Air Force Search and Rescue Teams, Artic divers.

Suits: Commercial grade, Nautilus.

Material: Is available as 420 denier or 840 denier nylon. The denier number refers to the size of the nylon filament. All suits have a polyurethane backing.

Sizes: Standard sizes or custom fitting available.

Nonmagnetic: No testing has been done.

Zipper: Waterproof zipper across the back from shoulder to shoulder; no covering system present.

Valves: Orion valves will be placed in the divers preferred location.

Wrists: Latex wrist seals, no glove attachment systems.

Hood: Neoprene hood with latex face seal (1/8-inch). Not attached and not guaranteed to be dry.

Boots: Choice of latex socks or light boots only.

Lead Time: Standard suit, 2 weeks; custom, not available.

Cost: \$509 for standard dry shell. Custom suit not available.

PARKWAY FABRICATORS DRY SUIT

Suit Manufacturer: The Parkway System  
241 Raritan Street  
South Amboy, N.J. 08879  
Telephone: (201) 721-5300

Company Information: The Parkway System has been involved in the sales and production of diving equipment for 32 years. In addition to making dry suits, they manufacture wet suits, exposure suits, masks, and fins. Their dry suit is the American version of the Poseidon unisuit.

Users: U.S. Navy SEAL teams, commercial divers.

Suit: The Thermo Pro II.

Material: Rubetex G231 blown Neoprene with nylon coating on the inside and outside. It measures 1/4 inch thick.

Sizes: Both standard sizes and custom suits are available.

Nonmagnetic: The Thermo Pro II is non-magnetic.

Zipper: The zipper runs down vertically from the abdomen, under the crotch, and up to the back.

Valves: Valves are placed on each side of the chest; I on the left and E on the right.

Wrists: Rubetex G231 wrist seals are present on the Thermo Pro II. No special glove attachment systems are available.

Hood: The hoods are integral with the suit and have a Rubetex G231 face seal.

Boots: No information available.

Lead Time: 30 days.

Cost: A standard Thermo Pro II suit is \$575.



### POSEIDON SYSTEMS DRY SUITS

Suit Manufacturer: Poseidon Industri Ab  
Åkeredsvägeul Box 8050  
42108 V. Frolunda, Sweden  
Telephone: 031-498440

Company Information: Poseidon, a Swedish company, has been a leading manufacturer of dry suits for many years. They formerly worked in conjunction with Parkway in the United States. Their suit is very similar to Parkway's present dry suit.

Users: Used by U.S. Navy divers in the past, no further information available.

Suits: Unisuit.

Material: The Unisuit is made of 7 mm expanded neoprene.

Sizes: Standard sizes are only available. There are no custom fit suits (sizes XS through XL).

Nonmagnetic: Not available.

Zipper: The zipper is waterproof and extends from the mid-abdomen down vertically through the crotch up to the low back. The Poseidon Jetsuit has the zipper across the upper back from shoulder to shoulder.

Valves: I: Right chest. E: left chest.

Wrists: Tight fitting neoprene wrist seals.

Hood: The hood is integral with the suit and made of neoprene with a neoprene face seal.

Boots: No information available.

Lead Time: Not available.

Cost: Not available.

### SOLENT DRY SUITS

Suit Manufacturer: Solent Divers  
Portsmouth LTD  
122128 Lake Rd  
Portsmouth, U.K. PO1 4HH  
Telephone: 705-814-924 (England)

Company Information: Solent Divers is a British company which makes wet and dry suits for commercial and military divers.

Users: Solent suits are used by the British, Pakistan, and Indian Navies, including the Royal Navy Special Boat Squadron, and are manufactured to meet NATO standards (0524).

Suits: Cold weather suit.

Material: Expanded polychloroprene (neoprene) double lined star quality 440, 9 mm thick.

Sizes: All Solent suits are custom "made to measure."

Nonmagnetic: Solent Divers does manufacture a nonmagnetic version.

Zipper: There is a 58-inch curved zipper which opens from the left breast around the neck, and back to the right breast. There is also a 4 mm thick zipper backing strip.

Valves: E: A Poseidon manual dump on left arm.  
I: Also a Poseidon inflation system.

Wrists: Solent cold weather dry suits have a 4-inch wide hard plastic tube which measures 4 3/8 inches in diameter. It is fitted at the end of the sleeve covered with 9 mm smooth neoprene. A 4 mm cuff is then attached to the outside of the smooth neoprene. Gloves are attached by wide elastic bands (rubber bands) over the glove material, neoprene and wrist tube.

Hood: The hood is integral with the suit and fitted with a 3 mm thick, smooth neoprene face seal.

Boots: The boots are 9 mm thick latex dipped neoprene with moulded rubber sole integral with the suit. The boots are exceptionally large to accommodate high loft undergarment material covering the feet. Extra large foot pocket fins are therefore needed.

Lead Time: One week.

Cost: £515 (U.K.) for dry suit alone.  
£695 (U.K.) including gloves/weights, and other accessories.

Additional Information: There are three weight pockets sewn on front of each leg between the knee and the ankle. Lead weights designed for these pockets are available.

A urine tube is fitted to the right knee, to protrude approximately one-half an inch outside of suit leg. It is made from reinforced rubber with a 3/16-inch diameter bore.

The suit is "made to measure" over the undergarment.

### TYPHOON DRY SUITS

Suit Manufacturer: Typhoon Water Wares  
8812 Brockville Road  
Silver Spring, MD 20910  
Telephone: (301) 589-6016

Company Information: Typhoon Water Wares is the U.S. distributor of Typhoon dry suits which are manufactured by Typhoon International, Inc., Great Britain. Typhoon Water Wares also modifies Typhoon dry suits. Typhoon developed the suit material which is used by DUI to make their TLS suits.

Users: Typhoon dry suits are presently used by U.S. Coast Guard divers, U.S. Navy SEAL teams, and as the lifesaving suit of the Royal Navy in Great Britain.

Suits: One style is available, the Pro Suit. Only available in black.

Material: Trilaminate butyl rubber sandwiched between durable nylon. The material is resistant to U.V. light, ozone, and most petrochemicals.

Sizes: Only standard sizes are available, but modifications can be made.

Nonmagnetic: No documented testing has been performed.

Zipper: Two zipper options are available. There is a back-entry waterproof zipper, with the zipper extending from shoulder to shoulder. There is also a front entry suit with the zipper horizontally across the abdomen.

Valves: Push button inflater and exhaust valves and a 34-inch inflater hose are standard. An optional vari-pressure exhaust valve is available. Typhoon Water Wares will place valves in any desired location.

Wrists: Wrist seals are available in latex or neoprene. A hard plastic ring system (4 1/4-diameter) is available for glove attachment, if desired.

Hood: May be attached to the dry suit or separate face seals are available in neoprene or latex. The dry hood features a specially designed skirt which tucks up under the body of the hood. This eliminates pull on the neck seal.

Boots: Boots are available in sport and commercial grades. The sport boot is vulcanized rubber and designed with strap fins. The commercial boot is molded of solid neoprene rubber with a thick cleated sole.

Lead Time: One week.

Cost: \$700 for a standard stock dry suit.

Additional Information: The seams of this suit are overlapped about one inch and glued, then the suit is taped on both sides. The adhesive is heat sensitive and all of the seams can be taken apart and replaced without damage.

## VIKING DRY SUITS

Suit Manufacturer: Viking America, Inc.  
55 Old South Avenue  
Stratford, CT 06497  
Telephone: (203) 377-6974

Company Information: Viking-Stavanger is a Norwegian company and the largest manufacturer of dry diving suits in the world. Besides dry diving suits, they also manufacture gas and chemical protective clothing and rubber coated textiles for military and civilian use.

Users: Viking dry suits are used by commercial and military divers throughout the world, including the U.S. Navy, U.S. Army, the Norwegian Navy, and special NATO forces.

Suits: Viking Pro, Viking Heavy Duty.

Material: Viking produces its own rubber material coated on polyester tricot. The smooth outer surface is very abrasion resistant, fast-drying and easy to clean and repair. Three thicknesses are available, Viking Heavy Duty being the thickest.

Sizes: Viking dry suits come in standard sizes only: sizes 0-4 for Viking Pro or 1-3 for the Viking Heavy Duty dry suit.

Nonmagnetic: Viking dry suits are nonmagnetic.

Zipper: Viking suits use a heavyweight, waterproof zipper. The zipper extends across the upper back from shoulder to shoulder.

Valves: I: Placed on left breast.  
E: Placed on left upper arm.

Viking manufactures their own valves and will place the valves in custom position.

Wrists: Wrist cuffs are made of super-elastic latex. A ring system for dry glove attachment is available. There is proposed research and development to develop a better dry glove attachment.

Hood: The dry hood is lightweight and made of elastic latex. An open-cell foam hood liner is available for warmth and comfort. Hoods are available as an integral part with the suit, or separate with a ring system for attachment to the body of the suit. A prototype dry hood using air and undergarment material has been developed.

Boots: Boots are made of heavy rubber and have non-skid soles.

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Lead Time: Two weeks.

Cost: Price for standard Viking Pro Suit is approximately \$900.

Additional Information: Viking suits are available in black and red and come with hood, inner hood, repair kit, and storage bag.

### III. DISCUSSION:

This market survey of currently available dry suits was done to help develop the optimal PTS to meet mission specific guidelines of U.S. Navy divers. It also serves as an accurate guide to U.S. Navy divers familiarizing themselves with the various dry suits prior to demonstrating or purchasing the dry suit of their preference. It needs to be reemphasized that dry suit diving authorities strongly believe that a diver must first have a minimum of 10 orientation dives before being considered a competent dry suit diver. Thereafter, divers can reliably evaluate dry suits.

Although four weeks were devoted to generating the most comprehensive survey possible, several dry suit features could not be discussed. Excluded features included dry glove information due to very few dry gloves available. It is well known that a dry glove capable of adequate thermal protection, reliable wrist connection, and reasonable dexterity has yet to be developed. This glove must be tailor made to meet differing mission specific guidelines of operations in both the Explosive Ordnance Diving (EOD) and Special Warfare (SpecWar) diving communities. It is anticipated that this report will stimulate the needed research and development of these PTS glove systems.

Other items excluded from this report include: more custom features such as special exhaust valves to allow venting of gloves and the hood, hoods with either air or undergarment insulation, the availability of a urinary overboard dump system (UODS) that does not leak, kink, or restrict urine flow, and the availability of custom pockets and weight pockets built into the suit, to achieve appropriate bouyancy in all positions underwater.

There has been only a few studies on dry suits objectively evaluating overall suit performance, including undesirable features and failures. Beyond the thermal physiology evaluation of man wearing PTS in water as cold as 29 °F (-1.7 °C), future investigations should include the following: ease of donning and doffing both dry suits and gloves, either alone or with assistance; diver flexibility and hand dexterity, and the ease of swimming and performing useful tasks for EOD and SpecWar mission scenarios. Also, other dry suit accessories such as urinary overboard dump systems, fins, full face masks, bouyancy compensators, and weight belts or integrated diving vests must be evaluated in 29 °F water. The question of whether a custom fitting dry suit decreases suit inflation needs, decreases underwater drag and increases diver mobility underwater compared to the stock or "off-the-rack" dry suit has yet to be determined.

### IV. SUMMARY:

This market survey of ten dry suit companies distributing heavy-duty dry suits serves two purposes; to assist the U.S. Navy diver selecting a dry suit, and inform researchers who are developing the optimal PTS to fulfill mission specific guidelines.